

# Intrapsychic and Interpersonal Correlates of HPA Activity in First-Time Expectant Mothers

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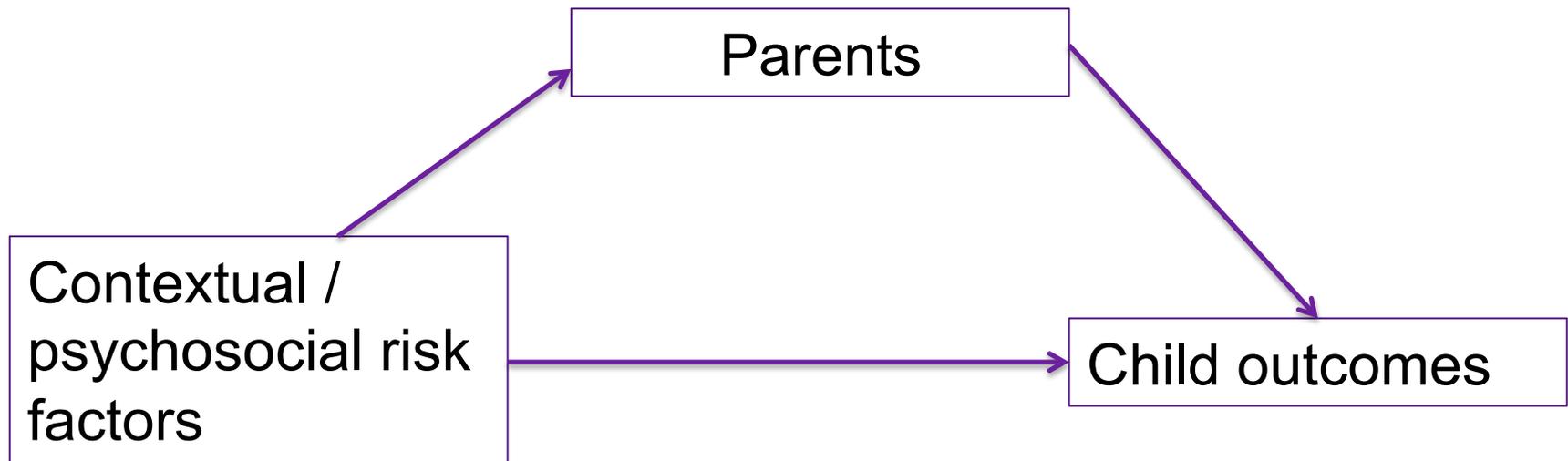
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## Intergenerational transmission of stress

### Parents and predictors of parenting behaviors

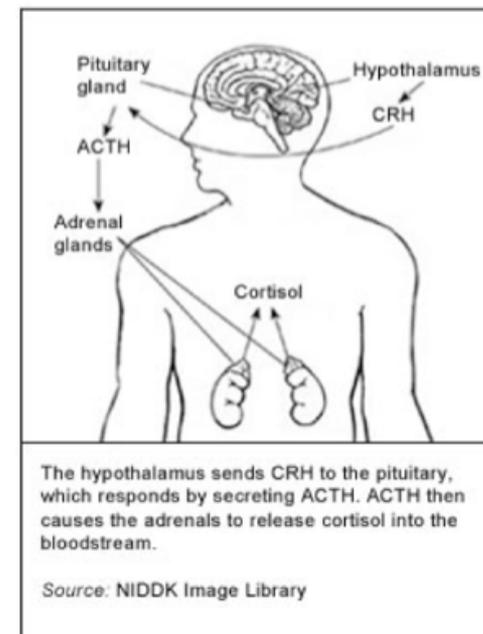


## Hypothalamic pituitary adrenal (HPA) axis

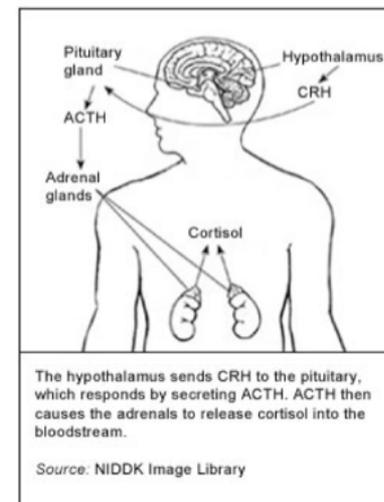
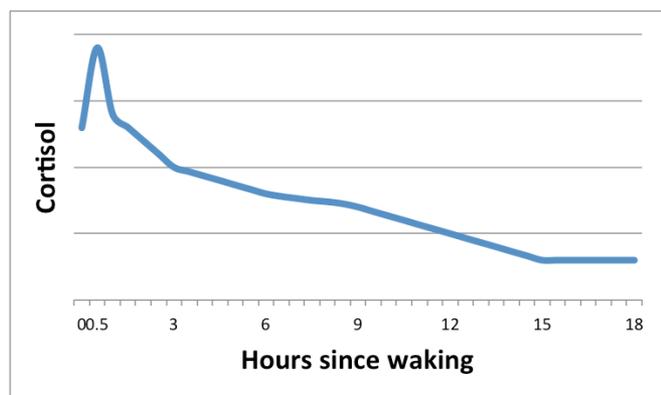
### Maternal HPA axis functioning

#### Associated with parenting behaviors:

- immediate postpartum (Fleming et al., 1997)
- later postpartum (Finegood et al., 2016; Krpan et al., 2005; Mills-Koonce et al., 2009)



## Hypothalamic pituitary adrenal (HPA) axis



- **Cortisol awakening response (CAR)** Preussner et al., 1997
  - Mixed evidence for effects of depression; PTSD and burnout and lower CAR; job stress increased CAR ; Chida & Steptoe, 2009
- **Early life adversity associated with CAR** (Gonzalez et al., 2009)
- **Diurnal cort associated with sensitive parenting** (Gonzalez et al., 2012)

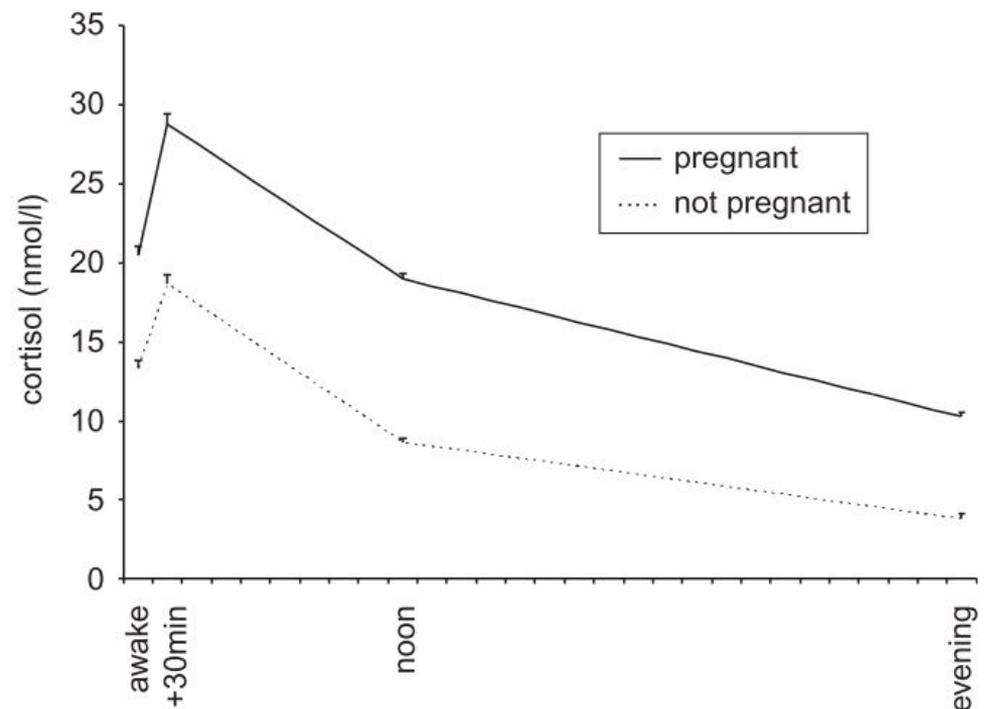
## Intergenerational transmission of stress

### Timing: Prenatal period

- Earliest that one can explore the intergenerational transmission of stress
- A critical point in the transition to parenthood.

## HPA axis during pregnancy

- Cortisol steadily increases during pregnancy ~ around 25 weeks gest.
- Circadian rhythm is detectable during pregnancy (Allolio, 1990; Magiakou, 1996)
- Cortisol awakening response is observed during pregnancy  
de Weerth & Buitelaar, 2005, *Psychoneuroendocrinology*



## HPA axis during pregnancy - **prenatal programming**

- Glucocorticoid exposure in utero associated w/ infant cognition & cortisol response

Prenatal Maternal cortisol levels (Davis & Sandman, 2010; Davis et al., 2011)

Amniotic fluid cortisol levels (Bergman et al., 2010; O'Connor et al., 2012)

- Prenatal psychosocial stress associated w/ infant cognition, behavior
  - Stressful life events (Bergman et al., 2007)
  - Pregnancy-specific anxiety (Davis & Sandman, 2010)
  - Perceived stress, anxiety, and depression (Davis et al., 2011)

## HPA axis during pregnancy - **prenatal programming**

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## HPA axis during pregnancy - **prenatal programming**

- However, the link between maternal psychosocial stress and prenatal maternal cortisol levels is less clear

**Prenatal Maternal cortisol levels** (Davis & Sandman, 2010; Davis et al., 2011)  
 uncorr w/anxiety, depress, preg.-specific anxiety; low corr w/ perceive stress

**Amniotic fluid cortisol levels** (Bergman et a., 2010; O'Connor et al., 2012)  
 uncorrelated w/ anxiety

**Prenatal maternal cortisol uncorrelated with:**

- pregnancy-specific hassles, distress, emotional well-being, pregnancy uplifts,
- anxiety and depression only weakly associated at 1 out of 5 time points in pregnancy.

## CAR and diurnal cortisol during pregnancy

- The studies that **have** found associations between maternal psychosocial stress and cortisol levels in pregnancy have not been consistent
  - Mixed evidence for **depression**; Shea et al., 2007; Hellgren et al., 2013; O'Connor et al., 2014
  - **Stressful life events** associated with higher evening levels in later pregnancy, associated with blunted morning levels in early pregnancy (Obel et al., 2005)
  - **Anxiety** associated with CAR in early but not late pregnancy (Pluess et al., 2010)
  
- Still no real consensus regarding the specific psychosocial predictors of prenatal maternal cortisol levels (O'Connor, 2014)

- **Situate the early transition to parenthood within its social reality.**
- **Quality of romantic relationships during pregnancy**
  - Prenatal health behaviors (Tolbert Kimbro, 2008)
  - Birth outcomes (Hohmann-Marriott, 2009)
  - Psychological well-being of parents (Kershaw et al., 2013)
- **Intimate partner violence (IPV)** Alhusen et al., 2015
  - 3%-9% of women experience abuse during pregnancy
  - Prenatal health behaviors: alcohol, smoking, illicit drugs (Bailey & Daugherty, 2007)
  - Mat. mental health: depression, suicide (Connelly et al., 2013; Palladino et al., 2011)
  - Birth outcomes – low birth weight and preterm birth (Shah et al., 2010)

- **Situate the early transition to parenthood within its social reality.**
- **Quality of romantic relationships during pregnancy**
  - Relationship functioning associated with higher morning cortisol and steeper diurnal decline in mothers of 2-year-olds (Adam & Gunnar, 2001)
  - During pregnancy, high perceptions of social support associated with more well-regulated HPA activity (Giesbrecht et al., 2013; Wadhwa et al., 1996)
- **Intimate partner violence (IPV)**
  - During pregnancy, blunted CAR and higher afternoon/evening levels (Suglia et al., 2010; Valladares et al., 2009)
- But in general, there has been very little work regarding relations between intimate partner relations and cortisol regulation in pregnancy.

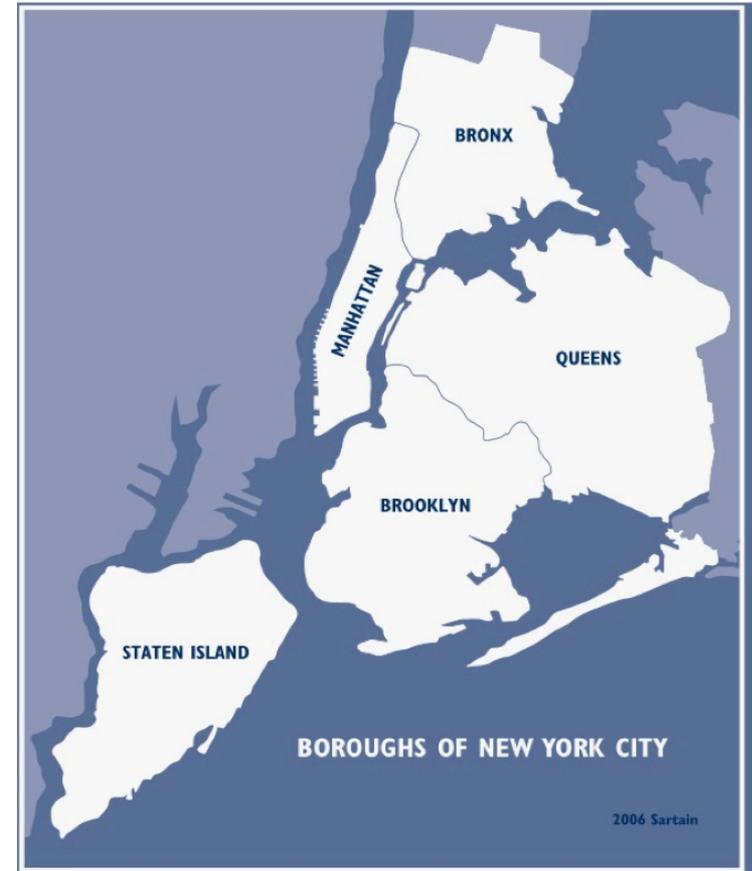
Assessed a number of different types of psychosocial stressors:

Depression, anxiety, couple (dis)satisfaction, partner conflict,  
social support

## Research questions

- Is there evidence that individual differences in CAR and in evening cortisol levels are associated with self-reported psychosocial stressors in a low-risk sample of mothers during late gestation?
- Are stressors related to relationship quality/functioning more strongly associated with individual differences in CAR and in evening cortisol than more broad stress processes (depression and anxiety)?

- Data for this analysis came from 86 expectant mothers who provided saliva samples and were seen at home visits at approximately 36 months gestation
- Recruited from an OB-GYN clinic and pregnancy classes at a hospital in lower Manhattan in NYC.



- **Primary caregiver descriptives:**
  - 100% biological mothers; 100% first-time parents
  - Parents in third trimester of pregnancy
  - Age mean (SD) = 33(3.2) years
  
- 68% of mothers had achieved at least a master's degree

## Measures

- **State anxiety (STAI-6)** Marteau & Bekker, 1992; 6 items;  $\alpha = .78$ ; 33% high anxiety
- **Depression (CESD)** Radloff, 1977
  - 20 items 5 point scale;  $\alpha = .76$  ; 16% high depression
- **Conflict Tactics Scale** (Straus & Douglas, 2004)
  - 5-item 5-point scale;  $\alpha = 0.58$ ; Mean = .48 SD = .33 (between 'never' and 'rarely')
- **Couple satisfaction index** (Funk & Rogge, 2007)
  - 16-item 6 point scale; "Our relationship is strong";  $\alpha = .95$ ; mean = 4.48 SD = 0.55
- **Perceived social support** (Zimet et al., 1988)
  - Significant other: 4 items  $\alpha = .91$  "There is a special person who is around when I am in need"
    - Mean = 6.5 SD = 0.54
  - Family subscale: 4 items  $\alpha = .92$  "I can talk about my problems with my family"
    - Mean = 5.5 SD = 1.23
  - Friends subscale: 4 items  $\alpha = .93$  "I can count on my friends when things go wrong"
    - Mean = 5.8 SD = 0.92

## Saliva samples

- 3 samples per day ~ 2 consecutive weekdays
  - Sample 1: Waking
  - Sample 2: Waking +30mins
  - Sample 3: evening
- Assayed for cortisol
- Averaged samples across two days  
or used data from a single compliant day
- 86 mothers with useable data



## Dependent variables

- Cortisol Awakening Response (CAR); Repeated-measures ANOVA
  - Waking and +30 mins within-subjects factors;
  - risk group (i.e. couple satisfaction) separated by median split as between-subject factor
- Evening cortisol levels; t-tests; risk group as between-subjects factor

## *Depression*

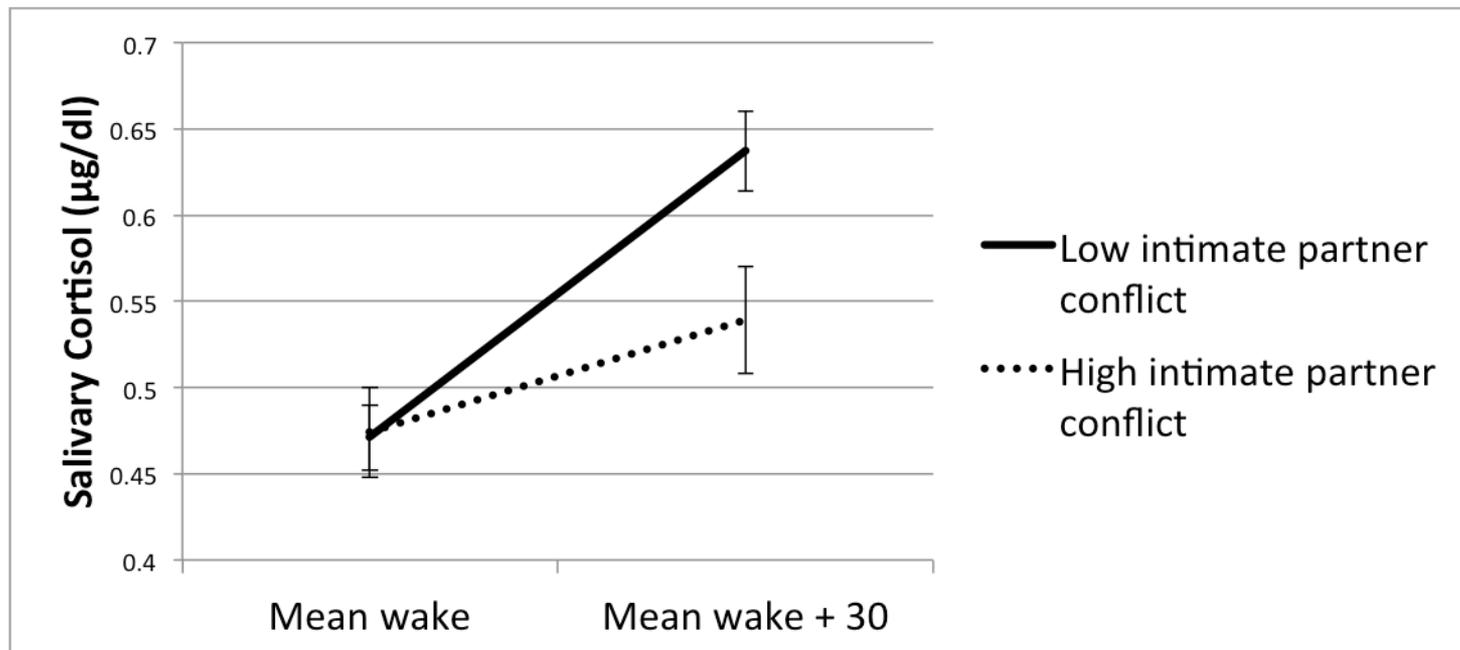
	Low depression symptoms M(SE) N = 72	High depression symptoms M(SE) N = 14	Test statistic	P value
Waking cort, µg/dl	0.47(.01)	0.45(.03)	Wilks lambda=.97, $F(1, 84)=2.31$ , $p = .13$	
+30mins cort	0.61(.02)	0.52(.04)		
Bedtime cort	0.18(.00)	0.20(.01)	$t(84)= .79$ , $p = .42$	

## *Anxiety*

	Low anxiety M(SE) N = 57	High anxiety M(SE) N = 29	Test statistic	P value
Waking cort, µg/dl	0.47(.02)	0.46(.02)	Wilks lambda=.98, $F(1, 84)=1.16$ , $p = .28$	
+30mins cort	0.61(.02)	0.56(.03)		
Bedtime cort	0.19(.00)	0.18(.01)	$t(84)= -.22$ , $p = .82$	

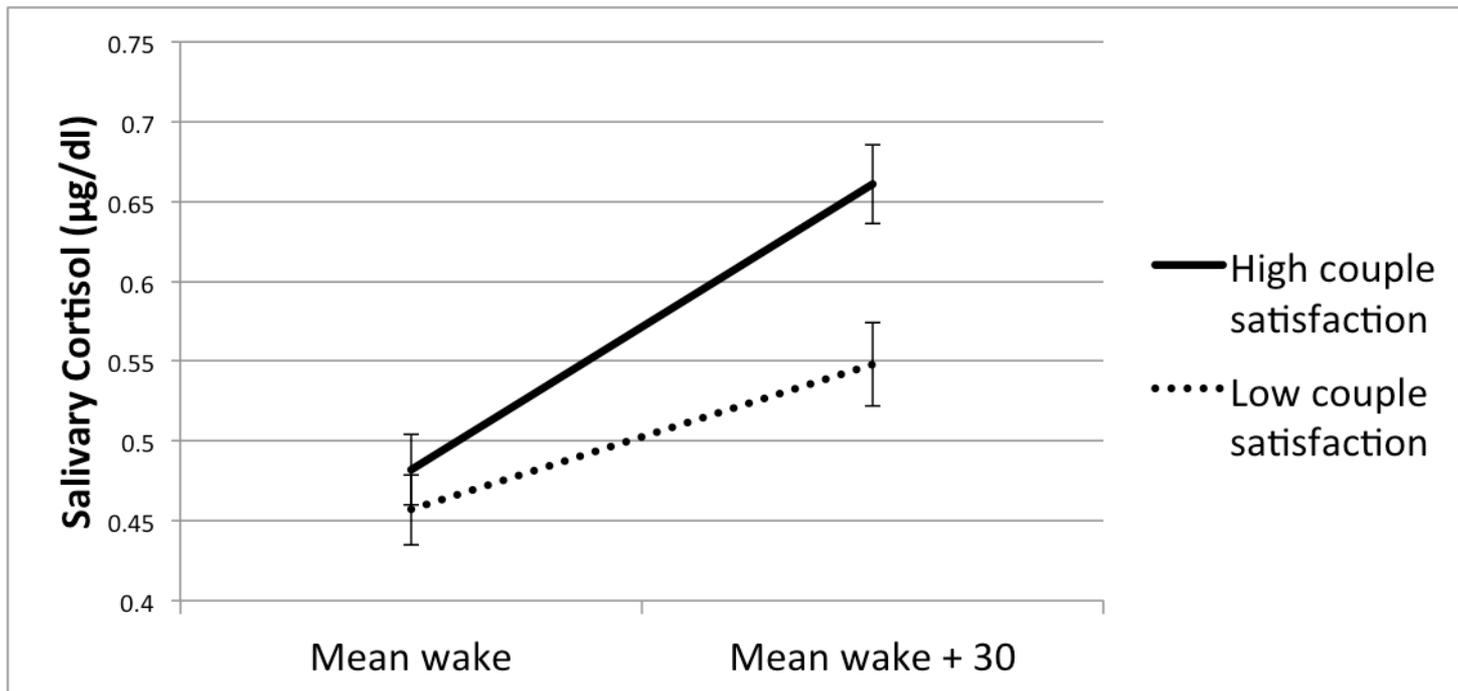
### Intimate Partner Conflict

	Low Conflict M(SE) N = 55	High Conflict M(SE) N = 31	Test statistic	P value
Waking cort, µg/dl	0.47(.01)	0.47(.02)	Wilks lambda = .91, $F(1, 83) = 7.68$ , $p = .007$	
+30mins cort	0.63(.02)	0.53(.03)		
Bedtime cort	0.18(.00)	0.18(.01)	$t(84) = -26$ , $p = .79$	



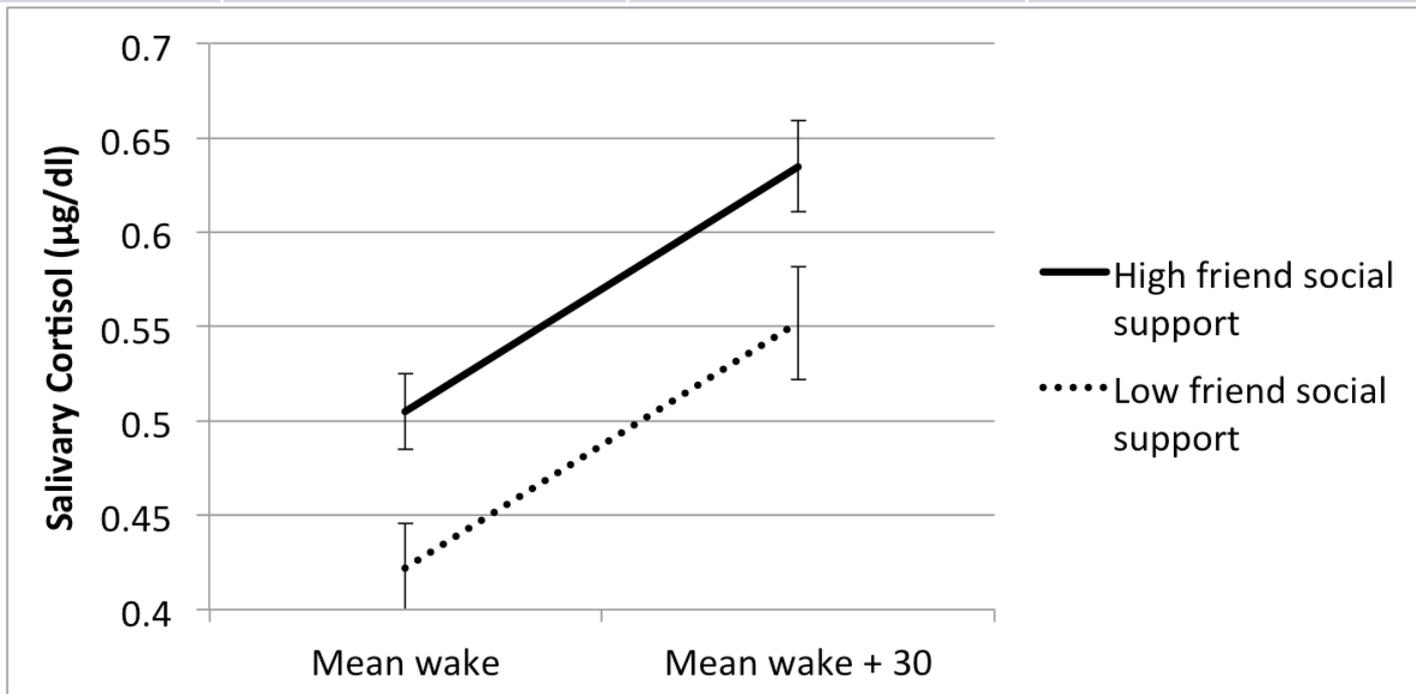
### Couple Satisfaction

	High Satisfaction M(SE) N = 45	Low Satisfaction M(SE) N = 41	Test statistic	P value
Waking cort, µg/dl	0.48(.02)	0.45(.02)	Wilks lambda = .92, $F(1,83) = 6.41$ , $p = .01$	
+30mins cort	0.66(.02)	0.54(.02)		
Bedtime cort	0.18(.00)	0.19(.00)	$t(84) = -1.04$ , $p = .29$	



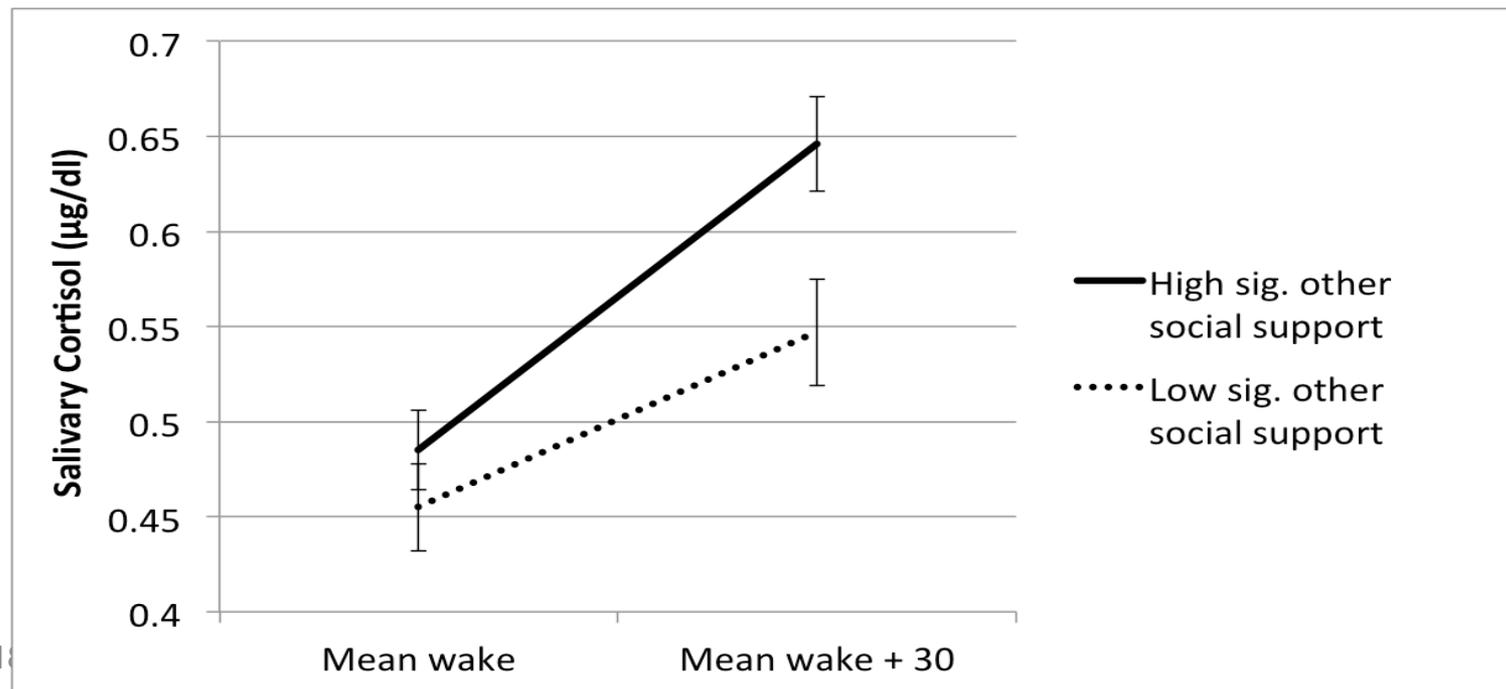
*Perceived Social Support: Friends*

	High social support M(SE) N = 52	Low social support M(SE) N = 34	Test statistic	P value
Waking cort, µg/dl	0.50(.02)	0.42(.02)	$F(1, 84) = 7.81, p = .006$	
+30mins cort	0.63(.02)	0.55(.03)		
Bedtime cort	0.19(.00)	0.17(.01)	$t(84) = 1.09, p = .27$	



*Perceived Social Support: Significant other*

	High social support M(SE) N = 48	Low social support M(SE) N = 38	Test statistic	P value
Waking cort, µg/dl	0.48(.02)	0.45(.02)	Wilks lambda = .96, $F(1,84)=3.54$ , $p = .06$	
+30mins cort	0.64(.02)	0.54(.02)		
Bedtime cort	0.18(.00)	0.19(.01)	$t(84) = -1.04$ , $p = .29$	



### *Perceived Social Support: Family*

	High Satisfaction M(SE) N = 40	Low Satisfaction M(SE) N = 46	Test statistic	P value
Waking cort, $\mu\text{g/dl}$	0.48(.02)	0.45(.02)	Wilks lambda = .99, $F(1, 84) = .31$ , $p = .57$	
+30mins cort	0.63(.02)	0.57(.02)		
Bedtime cort	0.17(.00)	0.20(.00)	$t(84) = -1.84$ , $p = 0.06$	

## Summary

<i>Correlated</i>		
<b>Intimate partner conflict</b>	Partner conflict, couple satisfaction, social support from friends and to some extent from significant others, were associated with individual differences in CAR.	
<b>Couple satisfaction</b>		
<b>Social support friends</b>		
<b>Social support significant other</b>		
<i>Uncorrelated</i>		
Social support from family	Depression, anxiety, and support from family were not associated with CAR, and there was suggestive evidence that support from family was associated with evening cortisol.	
Depression		
Anxiety		

## Summary

In this study of low-risk pregnant mothers we observed individual differences in regulation of cortisol associated with self-report measures of psychosocial stress. In particular, statistically significant associations were found among CAR and stressors having to do with **perceptions of relationship quality**, but not more general stress processes.

## Summary

- Future studies would benefit from further examination of the impact of the couple context and relationship quality on prenatal cortisol regulation.
- Models including child outcomes may help to answer questions regarding mechanisms of the intergenerational transmission of stress from parent to child during the early transition to parenthood.

**Thanks!**

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	Anx	Dep	CSI	IPC	SO	FAM	FR
Anxiety	1						
Depression	.42**	1					
Couple satisfaction	-.06	-.26*	1				
Intimate partner conflict	.15	.10	-.39**	1			
Social support Significant other	-.18	-.19	.53**	-.22*	1		
Social support Family	.01	-.14	.18	-.08	.18	1	
Social support Friends	-.03	-.33**	.12	.00	.20	.27*	1